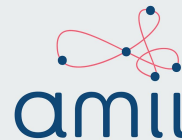
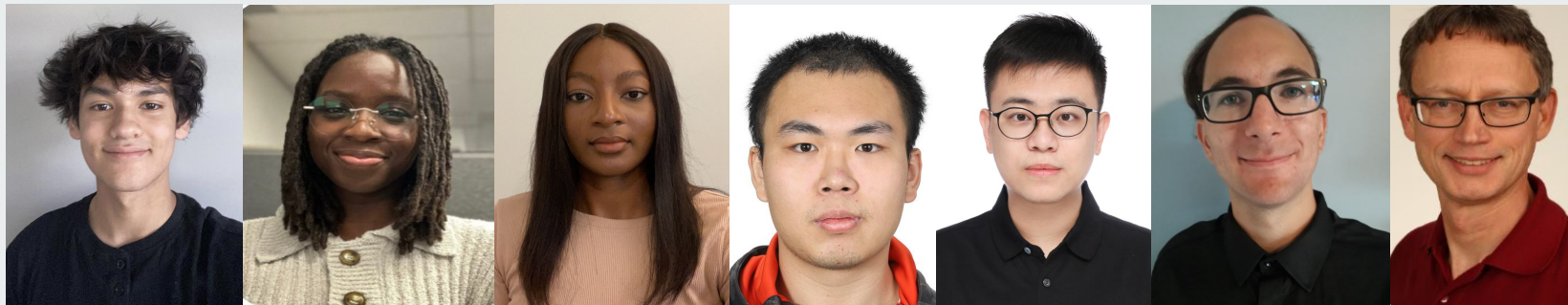




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Identifying Emotional and Polar Concepts via Synset Translation



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Tasks

Polarity Classification: seeks to determine the polarity (positive, negative, or neutral) of a piece of text.

murder → negative

Emotion Identification: seeks to determine which specific emotion(s) from a predefined inventory best reflects the meaning of a piece of text.

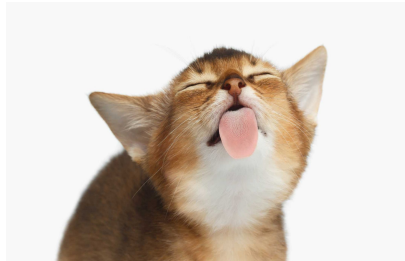
murder → anger, fear, sadness

Polysemous words

Assigning sentiments to words is ambiguous, as words can be polysemous (i.e. have multiple senses).

The verb to *lick* can mean:

- 1) To “pass the tongue over.”
- 2) To “beat thoroughly and conclusively in a fight.”
- 3) To “find the solution to or understand the meaning of.”



WordNet Synsets

To avoid ambiguity, we can label synsets rather than words:

- A **synset** is a set of synonymous word senses that express a distinct concept.
- WordNet is a lexical database containing English words that are grouped into 117,659 synsets.

Verb

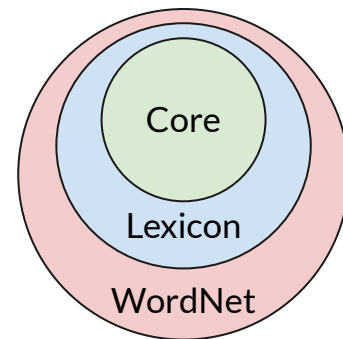
- S: (v) [cream](#), [bat](#), [clobber](#), [drub](#), [thrash](#), **lick** (beat thoroughly and conclusively in a competition or fight) *"We licked the other team on Sunday!"*
- S: (v) **lick**, [lap](#) (pass the tongue over) *"the dog licked her hand"*
- S: (v) [solve](#), [work out](#), [figure out](#), [puzzle out](#), **lick**, [work](#) (find the solution to (a problem or question) or understand the meaning of) *"did you solve the problem?"; "Work out your problems with the boss"; "this unpleasant situation isn't going to work itself out"; "did you get it?"; "Did you get my meaning?"; "He could not work the math problem"*

<http://wordnetweb.princeton.edu/perl/webwn>

Synset Level Resources

Emotion Identification

- **WordNet-Affect:** 3,000 total synsets, 36 emotions.
- **SentiSense:** 2,000 total synsets, 14 emotions.
- Both developed through similar semi-automatic process.
- Limited coverage, manual annotations take time.



Polarity Classification

- **SentiWordNet:** All WordNet synsets assigned positive, negative, and neutral polarity scores.
- Complete coverage means less accurate predictions.

Our Approach

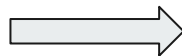
Automatically resolve ambiguity regarding polysemous words by utilizing multilingual translations. Based on the following assumptions:

1. Emotions are associated with **concepts**, not words
2. Emotions associated with concepts are **universal** across languages (not always true, but holds often enough to produce a useful lexicon)

Sense of *lick*

Dutch Translation

To “pass the tongue over.”



likken

To “beat thoroughly and conclusively in a fight.”



ranselen

To “find the solution to or understand the meaning of.”



oplossen

Method

English Synset

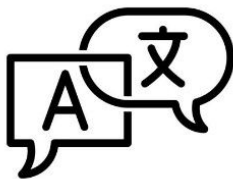
Gloss: marked by intense convictions; inclined to react violently

Part of Speech: adjective

Lemmas and Associated Sentiments:

- fierce: {anger, fear}, {negative}
- vehement: {anger, fear}, {negative}
- violent: {anger, surprise}, {negative}

Translation Source



Translations

Finnish: {hurja, kiihkeä}

French: {véhément}

German: {vehement, heftig}

Indonesian: {kuat, hebat}

Russian: {рьяный, неистовый}

Slovenian: {silovit}

Spanish: {violento, feroz}

Emotion Prediction

Confidence Score: 0.71

Predicted Emotion: fear

Polarity Prediction

Confidence Score: 0.71

Predicted Polarity: negative

Language	Emotions	Polarities
Finnish	{fear, anger}	{negative}
French	{fear, anger}	{negative}
German	{fear, anger}	{negative}
Indonesian	{joy, trust}	{positive}
Russian	{fear, surprise}	{negative}
Slovenian	{}	{}
Spanish	{fear, anger}	{negative}

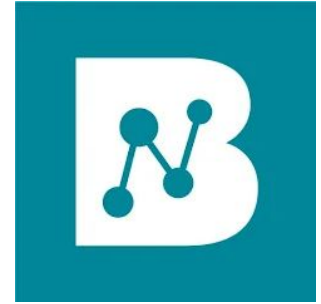
Multilingual Sentiment Lexicons



Multilingual Method Resources

BabelNet (Translation Source)

- Multilingual resource constructed by integrating various existing lexical databases.
- Highly accurate synset translations.



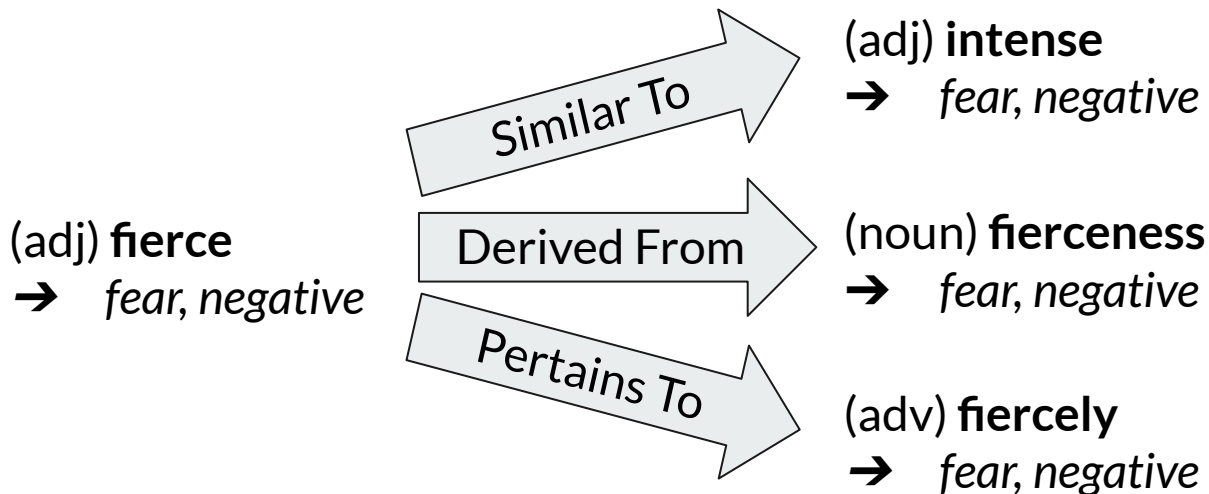
NRC Word-Emotion Association Lexicon (Multilingual Lexicons)

- Human annotators, 14,182 words, 8 emotions, 2 polarities.
- Developed in English, but translated into 108 languages.



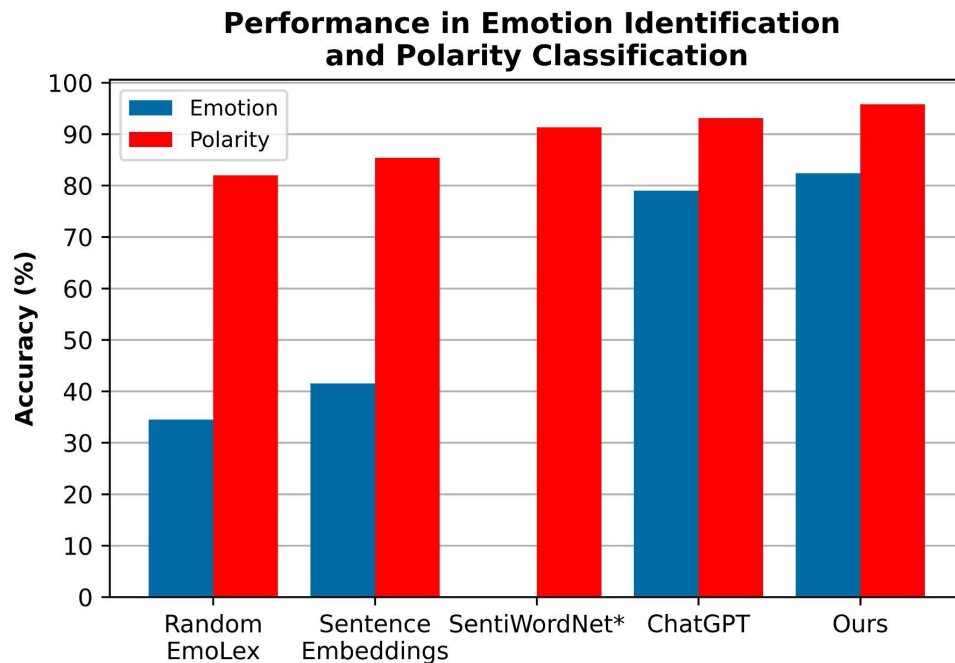
Extending Core

- Synsets found through the multilingual method constitute the lexicon's core.
- Core is extended using emotion-preserving WordNet relations, including *antonym*, *similar to*, *derived from*, *pertains to*, *attribute*, and *also-sees*.



SentiSynset

- 12,429 emotional synsets
- 15,567 polar synsets
- Significantly larger than comparable resource



*SentiWordNet only assigns polar labels, not emotional labels

Conclusion



- Leveraged multilinguality to develop an **automatic** method that assigns emotional and polar labels to word-senses.
- Created SentiSynset, a sense-level sentiment lexicon that is **significantly larger** than comparable resources.
- Labels assigned by our automatic method have **high-precision**.

github.com/UAlberta-NLP/SentiSynset